

# A REDESCRIPTION OF ACLERDA ISCHAEMI RAMAKRISHNA AND THE DESCRIPTION OF A NEW AFRICAN ACLERDA

(HOMOPTERA, COCCOIDEA)<sup>1</sup>

By HAROLD S. McCONNELL, *University of Maryland, College Park*

Since the publication of a paper by this author, "A classification of coccid family Acleridae" (1953), material of the two species considered below has become available.

## *Aclerda ischaemi* Ramakrishna

Figure 1

*Aclerda ischaemi* Green, 1930 (1929), MS Ramakrishna, Ayyar T. V. Agricultural Research Institute, Pusa, Bull. 197: 52.

*Aclerda imperata* Green, 1930 (1929), MS Ramakrishna, Ayyar T. V. Agricultural Research Institute, Pusa, Bull. 197: 52. *Nomen nudum*.

In 1929 Ramakrishna published the following note in Bulletin 197, page 52 of Agriculture Research Institute, Pusa: "123. *Aclerda ischaemi* Green, MS. Habitat. On Stem of *Ischaemum hirtum*. Sengleter, found with *Diaspis barbatus* G."

The note was accompanied by a pen sketch of a scale on a piece of the host. Apparently Ramakrishna sent this scale to E. E. Green for identification, who considered it to be an undescribed species and gave it the manuscript name *ischaemi*, which Ramakrishna published as indicated above. The pen sketch which accompanied the locality and host data is apparently adequate to validate the name *ischaemi* with Ramakrishna as the author.

Some unmounted specimens which are said to be part of the original collection of this species were received through the courtesy of the Entomology Staff of the Agricultural College and Research Institute, Coimbatore, South India, labeled as follows, "*Aclerda ischaemi* Green, MS on *Ischaemum hirtum*." More recently some unmounted specimens labeled as follows, "*Aclerda ischaemi* Green, MS on *Ischaemum hirtum*, Tinneveli Hills, 3000 feet, India, Coll. Ramakrishna, 12/VII/1921, No. 221A" was received from the British Museum through the courtesy of Mr. J. D. Doncaster of the Museum, and Dr. D. J. Williams of the Commonwealth Institute of Entomology.

On the same page of the publication in which Ramakrishna recorded *Aclerda ischaemi*, he recorded the name *Aclerda imparatae* Green, MS, giving only the host, locality, and date of collection for the material, as follows: "Habitat. On *Imperata arundinaceum*, Janjore, (Farm Manager, Collr.)." This is clearly *nomen nudum*. Three mounted specimens of this material, labeled as Ramakrishna recorded the name, were also received from the British Museum. They are clearly the same as *ischaemi*.

*Habit.*—The insects occur behind the leaf sheath of the hosts above the nodes; both males and females are found in this position. The young adult females are 2 to 3.5 mm. long and 0.60 to 1.5 mm. wide, flat, light brown in color, frequently with a considerable amount of white powdery wax beneath and along the margins. The older and fully mature females are larger, 8 to 10 mm. long and 4 to 5 mm.

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wide, convex, especially the abdomen; heavily sclerotized, ranging in color from brown to nearly black. Male test thin and glossy in appearance with a small amount of loose threads and powdery wax along the margins.

*Adult Female*.—The mounted adult females vary greatly in length and width, depending upon the stage of maturity. Young females 2.1 mm. to 3.6 mm. in length, and 0.66 mm. to 1.6 mm. in width, most of the specimens widest at the mid-abdominal area, tapered toward the anterior end, which is rounded; posterior end more abruptly narrowed, with sides nearly straight and serrate, the apex pointed, the angle between the sides somewhat more than  $90^\circ$  in the young specimens, and much more than  $90^\circ$  in the older specimens, caudal sclerotized area rather narrow, with only a few ridges and furrows, the margins serrate.

*Setae*.—The tuberculate marginal setae arranged in a band two to four irregular rows of setae wide around the body, the setae set close together in young specimens and more widely separated in older specimens; the band usually about two rows of setae wide at the anterior end, wider on the thorax and most of the abdomen, and two irregular rows wide at the posterior ends of the band, the latter set close together just above the margin; the ends of the band about three times the width of the anal plate anterior to the anal cleft. The setae vary somewhat in shape and size, the average is about nine  $\mu$  long and six  $\mu$  wide; those on the posterior parts of the band are somewhat shorter and appear stouter; the apex of these setae vary from rather pointed to quite blunt, and some of them are somewhat truncate.

The dorsal invaginated setae on each side of the abdomen widely spaced on the caudal sclerotized area, much more closely spaced on the membranous area anterior to the caudal area, and forward along the submargins where they are present sometimes nearly to the plane of the posterior spiracles, 75 to 80 each side; the setae variable in length and diameter, those on the caudal sclerotized area only slightly more than half as wide and considerably longer than those on the membranous part of the abdomen, the latter somewhat dumbbell shaped, about 12  $\mu$  long, with the apex projecting slightly above the derm, in the older specimens the lumens appear to have fine sculpturing.

Body setae more numerous on the ventral surface than on the dorsum and most of them longer and stouter; the ventral setae vary from stout and spine-like to rather small and acutely pointed.

*Ducts and Pores*.—Macrotubular ducts on both dorsal and ventral surfaces; the dorsal ducts noticeably larger, arranged in a submarginal band three to four ducts wide on most of the body, widened considerably on the posterior part of the abdomen, and some mingled with the marginal setae, these ducts about 15  $\mu$  long, the inner end distinctly flared and sclerotized, about two times as wide as the external opening; the ducts of the ventral band smaller but similar in shape, about 12  $\mu$  long and six or seven  $\mu$  wide, the band one to two irregular rows wide at the anterior end of body, gradually becoming wider toward the posterior, the band ends at about the plane of the genital opening. Microtubular ducts present on the ventral surface only, mesal to the marginal tuberculate setae, mingled with the ventral macrotubular ducts, the band extending from the head to about the mid-point of the abdomen, these ducts apparently absent on the posterior half of the abdomen, a group of about 20 are present on the derm at the base of the beak;

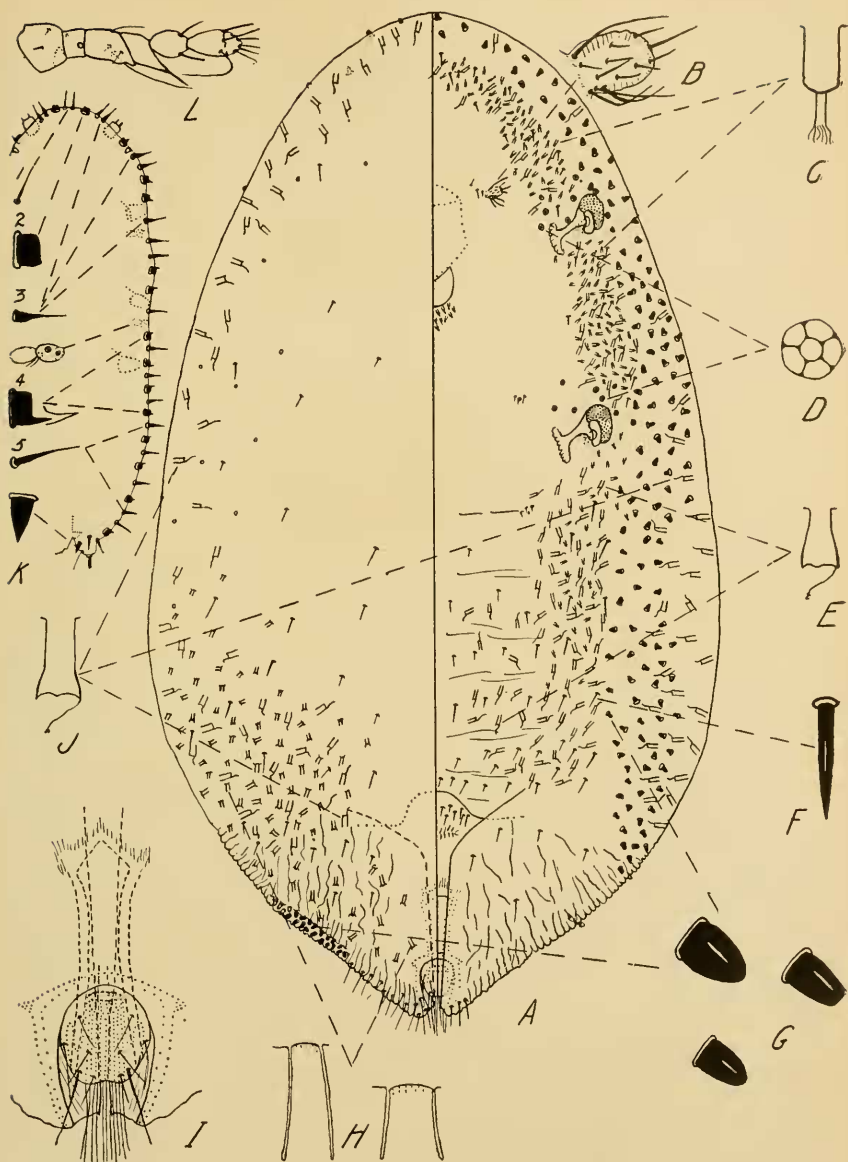


Fig. 1, *Aclerda ischaemi* Ramakrishna. Adult. a, body outline (early adult), left dorsal, right ventral, with microanatomical details, x60; b, antenna, x750; c, ventral microtubular duct, x1000; d, quinquelocular disc pore, x1000; e, ventral macro tubular duct, x750; f, ventral submarginal seta, x1000; g, marginal tuberculate setae, x750; h, dorsal invaginated setae, x750; i, anal complex, dorsal view, x160; j, dorsal macro tubular duct, x1000. Larva. k, lateral margin, with types of setae (greatly enlarged) showing their arrangement, x75; l, antenna, x160.

the band of ducts four to five irregular rows wide on the head and somewhat narrower on the abdomen; the ducts small, the tube about four microns long and half as wide, the tube and internal filaments together six to eight microns long.

Quinquelocular disc pores present on the derm anterior and lateral to the spiracles and in the atrium of the spiracles, none elsewhere on the body, the number on the derm quite variable and scattered, those at the anterior spiracle varying from five to 13 and those at the posterior spiracles four to 12. Simple dorsal disc pores few in number, these on the submargins anterior to the caudal sclerotized area.

*Anal Complex.*—Anal cleft about one and one-half times as long as wide on the dorsal surface, the invaginations from the cleft heavily sclerotized, usually with a variable length tubercle from each anterior lateral angle of the invagination, more prominent in fully mature specimens. Anal plate slightly longer than wide, about 75 microns long, basal portion widest, evenly rounded, then gradually narrowed toward the apex which is about half as wide as the base, apex variable in shape from deeply emarginate to sometimes truncate, with four or five setae on each side, two on the anterior third and three near the apex, the posterior lateral seta much longer and stouter than the others. Anal ring about half as wide as the anal plate, anal ring setae about two times as long as the anal plate. Anal tube apodeme about three times as long as the anal plate, the arms heavily sclerotized, posterior half sub-parallel, anterior half gradually widened, somewhat diamond shaped, the anterior end of the apodeme abruptly narrowed.

Antenna a conical tubercle, the base about 30  $\mu$  wide, and 12 to 15  $\mu$  high, with two or three short stout setae on the derm mesal to the base, with eight to 10 variable length setae on the cone, the longest ones about 35  $\mu$  long. Mouth framework prominent and heavily sclerotized, beak 1-segmented, rounded, wider than long. Spiracles prominent, atrium large, round, with a sickle-shaped band of pores on the upper wall, the bar variable. L-shaped or T-shaped. Evidence of leg vestiges sometimes present on the mesothoracic and metathoracic segments; they may appear as a group of three to five, small, with or without a sclerotized spur.

*Larva.*—Length 0.6 mm. to 0.8 mm., width at the thoracic area 0.2 mm. to 0.3 mm., anterior end rounded, slightly narrowed opposite the antennae and at the anterior spiracles; abdomen with margins approximately parallel, anal lobes definitely protruded. Antennae 6-segmented, stout, rather short, 140 to 160  $\mu$  in length; the basal segment globular and largest; II smallest, III asymmetrical, the posterior margin produced so that it is one-third to one-half longer than the anterior margin; IV, asymmetrical, the posterior margin greatly produced, terminating in a strong seta-like spur; V and VI spindle-shaped, VI longest, with a whirl of variable-sized setae below the apex, one quite long, apex with six to eight setae of variable sizes. Legs slender, tarsus approximately half as long as the tibia, tarsal digitules exceeding the claws by nearly one-third their length, faintly knobbed, claw digitules exceeding the claw, claws slender, nearly straight except at the base. Beak quadrate, wider than long. Spiracles rather large, cylindrical, most of them with two multilocular disc pores, one within the atrium and one at the margin, which is sometimes outside the atrium, and sometimes absent; bar long and narrow. Ventral microtubular ducts few in number, these arranged singly on the submargins of thorax and anterior abdominal segments.

Marginal setae of five fairly well defined types, varying from slender conventional setae to those that are button-shaped, and wider than long; there is some variation in the shape among the setae of the several types, which are arranged in definite sequences on the margins. The five types of setae are as follows: (1) slender conventional type setae (only two of this type); (2) button-shaped, broader than long, with a tiny apical marginal spur, sometimes without any evidence of a spur; (3) with a strongly inflated base, smaller than (2), with a marginal extension one to two times as long as the width of the base; (4) similar to (2) but with a variable marginal mucronate spur, usually shorter than width at base; (5) stout, spike-like setae, most of them evenly tapered, sometimes the basal portion somewhat enlarged, these principally on the abdomen. The marginal setae arranged as follows: the anterior marginals (those between the eyes) 10 in number, the median pair like (1), about  $15\ \mu$  long; the submedian pair like (2) sometimes with a minute marginal spur, the next two pairs are quite variable in shape and length, usually similar to (3), but they may be shorter with the basal half more inflated; the preocular pair like (4); the anterior lateral marginals (those between the eyes and the anterior spiracles) five on each side, the first two and fifth like (3) and the third and fourth like (4); the interspiracular marginals (those between the spiracles) five in number on each side, the first, second, and fifth setae like (5) and the third and fourth like (4); the abdominal marginals (those between the posterior spiracles and the anal lobes) 16 in number, types (4) and (5) alternating, except the posterior pair, the ultimate seta is like (2) (sometimes with a minute spur) and penultimate seta is like (5). The anal lobe dorsal setae three in number on each side, the median seta short, stout, somewhat narrowed at the base, then the apical half tapered to the acute apex; the lateral pair similar to (5) above but somewhat smaller. Anal lobe apical setae nearly as long as the body.

*Male*.—The wax test thin and glossy with a small amount of threads and powdery wax on the margins. The adult male winged, rather strongly sclerotized throughout; antennae 10-segmented, the two basal segments globular, the second strongly reticulated, the other eight imbricated and with numerous long stiff setae. Legs slender, tarsi and tibiae with numerous stout, stiff setae, claw digitules long and slender. Spiracles small, bar vase-shaped, with three quinquelocular disc pores outside the atrium. Body setae few in number, most of them small; dorsal abdominal setae arranged in segmental rows of four to seven setae, ventral setae fewer and smaller; marginal setae rather numerous, large and stout, especially on the posterior segments where there are five to eight on each side. Basal piece of penis sheath quadrate, apical piece funnel-shaped, the narrowed apical portion with numerous light-staining pore-like structures. The penis sheath is rather short, the anterior end is narrowed, while the posterior end is much broader.

The adult females of this species are similar to *A. zoysiae* McC., and *A. balachowskyi* described below as a new species. The larvae are similar to *A. coganicola* McC. and *A. balachowskyi*. The apparent relationship of these species will be discussed more in detail at the end of this paper.

This species was redescribed from mounted adult females, larva and males from the two lots referred to above. An adult female from the

British Museum lot was selected and labeled lectotype; the other adult females, larvae, and males from both lots were labeled as lectoparatypes. The British Museum specimen was designated as the lectotype since that lot of unmounted material had the same data as that published by Ramakrishna. The designation of a lectotype in this instance is not in strict accord with the International Code definition of a lectotype, since neither lot was specifically labeled as type material. The procedure followed seems to be a practical solution of the problem, since it is reasonably certain that the specimens at hand are part of those with which both Ramakrishna and Green were dealing.

The lectotype was deposited in the British Museum, lectoparatypes were returned to the Agricultural College and Research Institute, Coimbatore, South India and The British Museum; additional lectoparatypes were deposited in the United States National Collection of Coccids, and the author's collection.

***Aclerda balachowskyi*, new species**

Figure 2

The material on which this species is based was received from Dr. A. Balachowsky, Pasteur Institut, Paris, who kindly granted permission to describe it. It is labeled as follows: "On *Anadelphia arrecta*, Fulaya-Kindia, Guinea, French West Africa, 18-II-1953, Mr. Valardelo, Collector."

*Habit.*—The material was preserved in alcohol, with most of the specimens separated from the host material, which consists of short pieces of the basal part of the plant about one-half inch long, with a few specimens attached to the host. Most of the specimens are fully developed, and nearly all contain embryos. The mature females are quite convex, varying from nearly round to about two times as long as wide, with the ventral surface rather flat; at least some of them with considerable wax on the ventral surface. A few young adults were present, which are flat, and oval in shape. The fully mature females are 2.75 to 3.5 mm. long and 1.5 to 3.0 mm. wide. The early adults are 1.5 to 1.75 mm. long and about 0.75 mm. wide.

*Adult Female.*—The dimensions of mounted adult females approximately as indicated above. The fully mature specimens rounded, except the posterior apex which is pointed; the early adults, nearly two times as long as broad, the anterior end well rounded; the posterior end more angular, with much more than 90 degrees between the side, the apex broadly notched. The caudal sclerotized area rather narrow with a few straight, longitudinal ridges and furrows along the margins of both surfaces, some farther forward tend to be wavy and transverse; the posterior margins fairly straight and serrate.

*Setae.*—The tuberculate marginal setae arranged in a band around the body two to four irregular rows wide, except along the posterior margin where it is one or two irregular rows wide, and at the anterior end where the band is two irregular rows wide, the posterior ends of the band about two times the width of the anal plate anterior to the midpoint of the anal cleft; the setae vary somewhat in size and shape. The larger ones about nine  $\mu$  long, and six  $\mu$  wide, some are

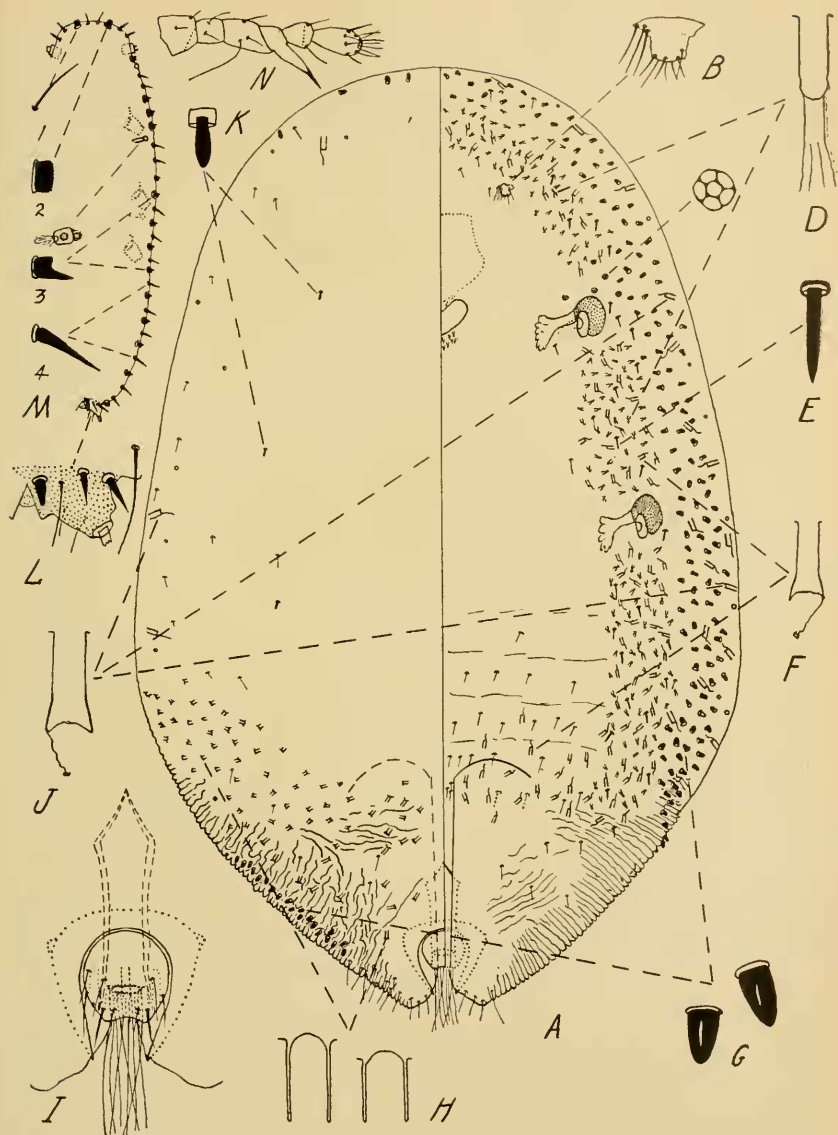


Fig. 2. *Aclerda balachowskyi*, new species. Adult. a, body outline (early adult), left dorsal, right ventral, with microanatomical details, x75; b, antenna, x500; c, quinelocular disc pore, x750; d, ventral microtubular duct, x1500; e, ventral submarginal seta, x1000; f, ventral macro tubular duct, x750; g, marginal tuberculate setae, x1000; h, dorsal invaginated setae, x1000; i, anal complex, dorsal view, x160; j, dorsal invaginated x750; k, dorsal submarginal seta, x1000. Larva. l, anal lobe, showing dorsal anal lobe setae (greatly enlarged); m, lateral margin, with types of setae (greatly enlarged) showing their arrangement, x75; n, antenna, x160.

considerably smaller, especially those on the caudal margins of the abdomen; they are broadest at about the midpoint, with the base slightly narrowed, and rather gradually narrowed from the midpoint to the blunt, rounded apex; there are about 20 conventional-shaped setae between the ends of the band of tuberculate marginal setae and the anal cleft, each about  $30\ \mu$  long.

Body setae few in number; the dorsal setae slender to flagellate in form on the caudal sclerotized area of the abdomen, 20 to  $25\ \mu$  long, anterior to this they are stouter and much shorter, nine to  $12\ \mu$  long, and spike-like or digitate, most of them on the marginal and submarginal area, but without any apparent segmental arrangement; ventral setae similar in form and size to the stouter dorsal setae, and having a transverse segmental arrangement on the abdomen.

The dorsal invaginated setae 60 to 70 in number on each half of the abdomen, rather widely spaced on the caudal sclerotized area, more numerous and more closely spaced on the adjacent membranous area and forward along the abdominal submargins; the setae variable in length and diameter, depending on their position on the abdomen, they appear longer and more slender on the heavily sclerotized caudal area, the longest ones about  $15\ \mu$  long, and shorter ones eight to ten  $\mu$  long, all with the dome-shaped apex projecting above the surface of the derm.

*Ducts and Pores.*—Macrotubular ducts present on both surfaces; the dorsal ducts noticeably larger, few in number, these on the submargins, most of them mingled with the marginal tuberculate setae, only an occasional duct occurs on the caudal sclerotized area; ventral macrotubular ducts smaller, much more numerous, in a band three to four irregular rows wide submarginal to the marginal tuberculate setae, the band ending at about the anterior margin of the caudal sclerotized area, and with a few ducts in transverse segmental rows on the mid-abdominal segments. Microtubular ducts on the ventral surface only, distributed similar to the ventral macrotubular ducts, and mingled with them, except that there are none in transverse segmental rows, and in addition there is a group at the base of the beak; the ducts about five  $\mu$  long, with an internal prolongation nearly as long as the duct, the ducts arranged in a band four to five ducts wide, the band ends at the anterior margin of the caudal sclerotized area.

Quinquelocular disc pores present in small numbers anterior and lateral to the atrium of the anterior pair of spiracles, usually three to seven; they are usually absent at the posterior spiracles, sometimes a single duct may be present.

A few simple disc pores are present on the dorsal submargins.

*Anal Complex.*—Anal cleft rather unusual in appearance in that it appears as a wide apical notch, somewhat like a flattened inverted V; shallow invaginations from the lateral margins of the cleft heavily sclerotized. The anal plate small, about as wide as long, approximately circular,  $72\ \mu$  in diameter, the posterior apex with a broad shallow notch or emargination, with four or five setae on the posterior half of each side, all similar in length and size except the lateral seta which is smaller and shorter; anal ring about half as wide as the anal plate, anal ring setae about two times as long as the anal plate, anal tube apodeme about three times as long as the anal plate, the arms straight and parallel, except at the anterior end where they diverge, the apex abruptly narrowed.

Antennae with a broad base and a narrower tuberculate projection from about the center of the base, there are three or four large setae on the mesal portion of

the base and five or six smaller setae on the tuberculate projection. Mouth framework prominent and heavily sclerotized, beak rounded, wider than long. Spiracles prominent, atrium with a somewhat sickle-shaped band of pores on the upper wall, the bar L-shaped. No evidence of leg vestiges observed.

*Larva*.—Length about 1.0 mm. and width 0.2 to 0.3 mm. wide at the thorax; anterior end rounded to truncate, narrowed at the antennae, and opposite the anterior spiracles; sides of the abdomen subparallel; anal lobes definitely protruded, but short and sclerotized. Antennae 6-segmented, stout, about 160  $\mu$  long; basal segment largest, II shortest and smallest, III asymmetrical, with the posterior margin one-third to one-half longer than the anterior margin, IV asymmetrical, short, the posterior margin greatly produced and terminating in a long slender spur which is about three times as long as the anterior margin, the apex of the spur extending to about the midpoint of the apical segment; V and VI spindle-shaped, VI somewhat larger and about one-half longer. Legs slender, tarsus about half as long as the tibia, tarsal digitules slender, faintly knobbed, exceeding the claw, claw digitules slightly knobbed, exceeding the claw by one-third its length. Spiracles rather large, cylindrical, with two multilocular disc pores, one apparently outside the atrium, a few ventral microtubular ducts present on the abdomen and thorax, usually one or two on each side of the thorax, and two to four on each side of the abdomen, never more than one on the side of a segment, sometimes apparently entirely absent.

Marginal setae of four well defined types varying from slender conventional setae to those that are button-shaped and wider than long. Some variation occurs in the shape of all these types of setae except conventional form; the setae arranged in definite and constant sequence on the margin. The four types are as follows: (1) slender conventional setae (only two of this type); (2) button-shaped, broader than long and without an apical marginal spur, the discal apex papillate; (3) somewhat similar to (2) but smaller in diameter, and longer, and with a marginal apical spur that is variable in size and length. These marginal setae arranged as follows: the anterior marginals (those between the eyes) 10 in number, the median pair like (1), 15 to 20  $\mu$  long; the submedian pair like (2), about four  $\mu$  long and 12  $\mu$  in diameter, the next two pairs like (4), but sometimes they appear to have the basal portion larger, the preocular pair like (3). The anterior lateral marginals (those between the eyes and anterior spiracles) five on each side, the first two pairs like (4) and the other three pairs like (3). The interspiracular marginals five in number on each side, the first two and fifth like (4) and the third and fourth like (3). The abdominals (those between the posterior spiracles and the anal lobes) 16 in number on each side, types (3) and (4) alternating, except the posterior pair where the ultimate seta is like (2) and the penultimate seta is like (4), sometimes an extra seta may occur in the anterior groups of setae. The anal lobe dorsal setae three in number on each lobe, the median seta short and stout, somewhat narrowed at the base, the apical half narrowed, the apex bluntly rounded; the other two setae placed anterior to the median seta, and in about the same plane near the anterior lateral margin of the lobe, the lateral seta larger and longer, both similar in shape to (4) but smaller. The apical seta somewhat longer than the abdomen.

*Male*.—Only the glossy test observed.

*Type Locality*.—Fulaya-Kindia, Guinea, French West Africa, on *Anadelphia arrecta*.

*Types*.—Holotype, an early adult female, deposited in the United States National Collection of Coccids. Paratypes, numerous adult females, most of them fully mature, a few early adults, and numerous larvae, some returned to Dr. Balachowsky, some deposited in the United States National Collection of Coccids, and some in the authors collection, all collected on *Anadelphia arrecta*, Fulaya-Kindia, Guinea, French West Africa, Mr. Valardelo, collector.

The adult females of the two species considered above, and *A. zoysiae* McC. are similar, and some difficulty may be encountered in differentiating them. *A. ischaemi* and *A. balachowskyi* both run best to couplets 16 and 20 of the McConnell key (1953), despite both having the angle between the sides of the posterior end of the body greater than  $90^\circ$ . *A. balachowskyi* can be separated from the other two species by the paucity of dorsal macrotubular ducts, there being only 20 to 30 and most of these intimately associated with the marginal tuberculate setae; further, there are practically no ducts on the caudal sclerotized area; the anal plate is nearly round while the plate of *A. ischaemi* and *A. zoysiae* is more elongate and tapered toward the posterior apex. *A. ischaemi* and *A. zoysiae* are very similar, and when adequate material of all the stages becomes available, it may be found that *A. zoysiae* is a synonym of *A. ischaemi*. The most striking difference is in the marginal tuberculate setae, the setae of *A. zoysiae* are smaller and more acutely pointed and the body setae are smaller.

The larvae of *A. coganicola* McC., *A. ischaemi*, and *A. balachowskyi* are similar, but the larva of *A. zoysiae* is unknown to the author. The larvae of the first three species will run to couplet 4 of the McConnell key (1953). The anterior marginals of *A. balachowskyi* and *A. coganicola* are quite similar, differing principally in the form the submedian pair of button-like setae; in *A. balachowskyi* nearly all of them have a minute lateral spur, while in *A. coganicola* they are without a spur; these two species have different shaped median dorsal anal lobe setae; in *A. coganicola* it is short and thumb-shaped, while in *A. balachowskyi* it is larger, longer, with the apical half tapered to a round, blunt apex. *A. ischaemi* differs from the other two species principally in having the two preantennal pairs of setae of the anterior marginal group longer and the basal part less inflated, and also in the shape of the fifth seta of the anterior lateral group of setae; it is like the first and second setae rather than like the third and fourth.

This species is named for Dr. A. Balachowski, eminent French coccidologist, who supplied the material upon which the species is based.

#### REFERENCE

- McConnell, Harold S., 1953. A classification of the coccid family Aclerididae. Maryland Agricultural Experiment Station Bulletin A-75:1-121.